

STUDIES IN THE HELIANTHEAE (ASTERACEAE). II.

A SURVEY OF THE MEXICAN AND CENTRAL AMERICAN

SPECIES OF SIMSIA.

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The genus Simsia containing about 35 species is known from southern Texas and New Mexico southward to Argentina with 1 species in the West Indies. The genus has some complexity in South America, especially in the northern Andes, but the greatest concentration of species and greatest variation is in Mexico and Central America. Studies of the genus have occurred sporadically since the original description by Persoon (1807), with a lapse after the works of Bentham and Hooker (1873) and Asa Gray (1883) who reduced the genus to a section of Encelia. The genus Simsia was revived by Blake (1913) in his careful revision of Encelia and related genera. Blake in that treatment and in two later papers (1917, 1928) clarified many species concepts and named ten new species. Studies of Mexican and Central American species have again lapsed since Blake's work, but attempts to identify recent collections have proven the need for many additions and revisions. The present survey is intended to summarize results based on material in the U.S. National Herbarium and in many cases utilizes notes and material of types accumulated by Dr. Blake.

The generic limitations of Simsia are given best by Blake (1913) in his key to Encelia and related genera. The characters can be adapted as follows: Leafy stemmed, lower leaves opposite; paleae rigid, acute or acuminate, persistent; ray flowers not fertile; style branches attenuate, hispid-villous; disk achenes very flat, wingless, without squamellae, not villous-ciliate.

The present study has concerned primarily the delimitations of the species of Simsia. Many of the characters have been found to be reliable only within certain groups. Some of the groups and species cited below should be seen for further discussion. The lower nodes often bear foliaceous disks representing fused expanded petiole bases. These disks are consistently present in some groups of species (Group H) are variable between related species in other groups (Group G) and variable within some species (Group A). Leaf shape is particularly variable in some species (Group B) with lobing and the wings or lack of wings on the petioles often being totally unreliable (Group G). In some cases winged petioles seem more

consistent (Group E, *S. annectens*; Group H, *S. grayii*). Pubescence of leaves and stems is one of the most reliable features and has been used extensively in deriving the concepts in this survey. Presence of glands is a useful character in some species (Group G, *S. foetida*; Group H, *S. subsetosa*) but it is variable along with other pubescence characters in at least one species (Group D, *S. lagascaeformis*). The useful inflorescence characters include differences in habit (Group F, fig. 1; Group H, *S. steyermarkii*, fig. 2), and differences in the shape of the phyllaries and paleae (Group G, figs. 4-5). Use of phyllaries is complicated by the need to properly distinguish the outer paleae from the phyllaries and by the tendency of the tips of many phyllaries to elongate as the head matures (Group G, figs. 9-10). Other floral features differ among the species primarily in size and number. Size of heads seems characteristic of *S. setosa* (Group H), size of achenes is apparently significant in *S. guatemalensis* but not in *S. grandiflora* (Group G). Number of phyllaries and ray flowers is distinctive for *S. calva* (Group E) and *S. grandiflora* (Group G), and complete lack of ray flowers distinguishes Group C, though the character requires very careful observation. Presence or absence of awns on achenes has been used to distinguish some species but proves unreliable in *S. lagascaeformis* (Group D) and many other species which produce individuals with glabrous awnless achenes. The value of the character is doubtful in Group A, but reduction of awns may be more consistent in *S. calva* (Group E).

Microscopic characters of the flowers of *Simsia* have been examined but no consistent distinctive features between species have been noted. Characters are as follows. Ray achenes slender, elongating with age, bearing few or rarely many setae; disk corollas with short tube abruptly expanded into cylindrical throat being more expanded toward outer side in *S. calva*, outer surface scabrous with stiff antrorse spines which are broad at base and have sharply pointed short apical cells, some setae of lobes often long, tube and lower throat bearing scattered thin-walled scarcely capitate glands; corolla lobes 5, 1.5-2.0 times as long as wide, cells of outer surface smooth, cells of inner surface each bearing cylindrical papilla, papillae of upper and marginal cells larger and more contiguous; anther filament weak and capable of great elongation in lower part, upper filament

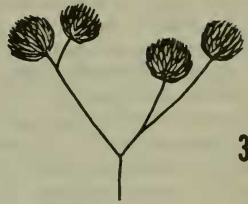
Figures 1-13. *Simsia*. 1-3. Inflorescences. 1. *S. hintonii* n.sp. 2. *S. steyermarkii* n.sp. 3. *S. grandiflora* Benth. ex Cersted. 4-5. Outer paleae. 4. *S. chaseae* (Millsp.) Blake. 5. *S. lagascaeformis* DC. 6-8. Corolla and stamens of *S. amplexicaulis* (Cav.) Pers. 6. Corolla showing distribution of glands and hairs. 7. Stamens showing distribution of glands and hairs. 8. Detail of hair from abaxial surface of stamen. 9-13. Heads showing involucre. 9-10. *S. grandiflora*. 9. Young. 10. mature. 11. *S. molinae* n.sp. 12. *S. hintonii* n.sp. 13. *S. grayii* Blake.



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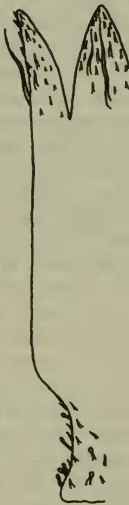
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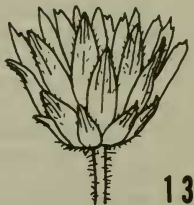
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firm with mostly short oblong to subquadrate or shorter cells with walls variously collenchymatous sometimes weakly lined; anther connective usually bearing on outer surface few to many long slender firm-walled setae with very sharp pointed apical cells; exothecial cells quadrate with single small thickenings on each tranverse wall; anther appendage usually bearing on outer surface a cluster of thin-walled small capitate glands; nectary short cylindrical with thin upper margin, not lobed; style base bulbous, sunken about halfway into nectary; style branches densely haired on backs to near or just below base of branch, hairs pointed thin-walled 1-2 septate, grading into elongate pointed papillae on short slender appendage; achene smooth externally, usually with numerous appressed setae, walls of achene in transmitted light with minute punctations and 30-35 narrow longitudinal lines, carpopodium forming a pale bilobed margin pinched closed in mature achenes, with small mostly oblong cells in 2-3 rows, cell walls thin to slightly thickened, densely beaded.

The past placement of Simsia in the synonymy of Encelia seems to have misrepresented the true relationships of the genus. Viguiera H.B.K. is far more like Simsia in having often opposite leaves, flowers with similar form and pubescence, and achenes flat differing only in the presence of squamellae. A number of Viguiera species also show setae on the backs of the anther connectives though of different wall structure from those in Simsia.

The chromosome number has been reported for many species of Simsia, but voucher specimens have been seen for only S. amplexicaulis (Cav.) Pers. and S. pubescens Triana. All reports are for $n = 17$ or ca. 17. The number is common in many related genera (Turner, Ellison & King, 1961; Turner, Powell & King, 1962; Solbrig, Kyhos, Powell & Raven, 1972).

SIMSIA Pers., Syn. 2: 478. 1807 excl. S.? heterophylla.

(Lectotype Coreopsis amplexicaulis Cav.).

Armania Bert. in DC., Prod. 5: 576. 1836.

(Type Hopkirkia fruticulosa Spreng.).

Barrattia A.Gray & Engelm., Amer. Jour. Sci. ser. 2. 3: 274.

1847. (Type Barrattia calva A.Gray & Engelm.).

The genus was dedicated to Jacob Sims, editor of Curtis' Botanical Magazine from 1784 to 1816. The present treatment recognizes 24 species in the area of Mexico and Central America. The species can be distinguished by the following key and subkeys.

1. Leaves silky silvery-white with appressed pubescence below
Group A
1. Leaves with erect or coarse pubescence below

- | | |
|--|---------|
| 2. Ray flowers prominently purple or pink throughout | Group B |
| 2. Ray flowers when present partially or completely yellow or whitish | 3 |
| 3. Ray flowers absent | Group C |
| 3. Ray flowers or remnants of ray flowers present | 4 |
| 4. Inflorescence rather strongly cymose with stiff widely diverging branches (Fig. 1) | Group F |
| 4. Inflorescence cymose-paniculate with heads densely clustered or on rather long erect pedicels (Figs. 2-3) | 5 |
| 5. Phyllaries subequal in length, sometimes with narrow shorter outer phyllaries (Figs. 9-10) | 6 |
| 5. Phyllaries distinctly unequal in length, outer phyllaries ovate (Figs. 11, 13) | 7 |
| 6. Stems retrorsely scabrous | Group E |
| 6. Stems with erect or antrorse pubescence | Group G |
| 7. Bases of lower petioles not forming foliaceous disks, narrow or broad but not connate | Group D |
| 7. Bases of lower petioles connate, forming foliaceous disks on nodes | Group H |

GROUP A. The group contains the following two species.

Simsia ghiesbreghtii (A.Gray) Blake, Proc. Amer. Acad. 49 (6): 392. 1913.

Encelia (Barrattia) ghiesbreghtii A.Gray, Proc. Amer. Acad. 8: 658. 1873.

The range of the species includes southern Mexico (Chiapas) and Guatemala. The species is characterized by achenes being glabrous and awnless. The paleae have margins coarsely toothed and nearly glabrous as in species of Group G, but the unequal phyllaries and dense pubescence on the undersurface of the leaves indicate closer relationship to S. pubescens Triana and S. pastoensis Triana of Colombia. This group is also like the colombian species in the very variable development of foliaceous disks on the stem nodes. The disks vary from large to lacking on many specimens and are certainly not taxonomically significant.

Simsia sericea (Hemsl.) Blake, Proc. Amer. Acad. 49 (6): 393. 1913.

Encelia sericea Hemsl., Biol. Centr.-Am. 2: 185. 1881.

The type specimen and all subsequent collections seen are from Guatemala. The species is only a weak segregate of S. ghiesbreghtii, being distinguished by the pubescent achenes with well-developed awns. Blake (1917) offers doubts of the value of the achene character citing the five other species in the genus where it is variable (S. calva, S. setosa, S. exaristata, S. amplexicaulis and S. sanguinea).

GROUP B. The group contains the following one species.

Simsia sanguinea A.Gray. Smiths. Contr. Knowl. 3: 107. 1852.

The range of the species includes Jalisco eastward to Veracruz and Oaxaca extending southward into Guatemala. The species is extremely variable in leaf form. Leaves are usually strongly trilobed but plants from Jalisco with leaves less lobed with sessile broad wings on the petiole and with paler flowers have been placed in var. palmeri (A.Gray) Blake. One specimen from Chiapas, about 36 miles west of Villa Flores, about 2500 ft., Nov. 1, 1965, Cronquist & Sousa 10461 (NY, US) has completely unlobed narrowly linear-lanceolate leaves and rather pale rays. Three further specimens from Guerrero, Mina: Placeres-Cigarillo, 450 m, Hinton 9818 (US); Mina: Jiotes, 500 m, Hinton 10647 (US); and Coyuca: Cutzamala, Hinton 6706 (US), have leaves very narrowly deeply and sometimes profusely lobed, petioles scarcely winged, and achenes usually large (6-7 mm long).

GROUP C. The group contains the following two species.

Simsia eurylepis Blake, Proc. Amer. Acad. 49 (6): 382. 1913.

Examination of specimens shows that the prominent expanded bases of the petioles sometimes fuse into distinct foliaceous disks. Expanded petiole bases are found also on one of the two stems on the type sheet of the closely related S. submollicoma. To the original collection from Ciudad del Maiz in San Luis Potosi (Seler 684, US) should be added the following records: San Luis Potosi: 15 miles east of C. de Valles, flat brushy area, Aug. 23, 1957, Waterfall 14300 (US); Tamaulipas: vicinity of Tampico, alt. about 15 meters, March 10 to April 19, 1910, Palmer 250 (US, part of type of S. submollicoma Blake); Tampico, sandy empty lot toward bluff summit, rays orange-yellow, July 20, 1965, R.Kral 25003 (US).

Simsia submollicoma Blake, Proc. Amer. Acad. 49 (6): 381. 1913.

The species is known only from the type specimen from the vicinity of Tampico. The species seems too close to the

preceding but it is retained here provisionally on the basis of the one stem of the type sheet which lacks auricles on the petiole bases.

GROUP D. The group contains the following three species.

1. Paleae puberulous or scabrous without long hairs (Fig. 4),
phyllaries with little or no reddish coloration S. chaseae
1. Paleae with small fringe of hairs near tips, phyllaries
often distinctly reddish at tips 2
2. Heads with 20-25 disk flowers; lower stems mostly 4-5 mm in
diam; achenes usually without awns S. exaristata
2. Heads usually with 10-15 disk flowers, rarely 18 or 20;
lower stems mostly 2-4 mm in diam; achenes usually with
distinct awns S. lagascaeformis

Simsia chaseae (Millsp.) Blake, Proc. Amer. Acad. 49 (6): 385.
1913.

Encelia chaseae Millsp. in Millsp. & Chase, Field Mus. Pub.
Bot. 3: 125. 1904.

The species is apparently restricted to Yucatan. The habit and paleae are like members of Group G and the numerous glands on the stems and leaves are somewhat reminiscent of S. foetida of that group. Simsia chaseae is distinct by the outer phyllaries being shorter and usually much broader.

Simsia exaristata A.Gray, Smiths. Contr. Knowl. 5, Art 6: 87.
1853.

The species is known from New Mexico, Texas, Sonora and Chihuahua. A specimen cited from Orizaba in Veracruz has not been seen in this study. Blake (1917) in his later note on the species named var. perplexa on the basis of a single specimen from Texas which had awns on the achene. Blake maintained the species as a weak segregate of S. lagascaeformis having a more northern range, generally fewer and larger heads, and leaves not glandular beneath. The leaf pubescence of S. lagascaeformis proves to be variable but the characters of the head with the greater number of disk flowers and the generally more robust form of the plants do seem distinctive.

Simsia lagascaeformis DC., Prod. 5: 577. 1836.

The species is known in Mexico from Colima eastward to San Luis Potosi, Puebla and Oaxaca. The pubescence of the leaves shows some variations in length of pubescence and occurrence of glands. Hairs on the leaves are very fragile and pubescence is

sometimes nearly destroyed in older leaves, but careful observation shows that there are real differences in length of hairs from very short to rather long and pilose on different plants. Blake (1917) implied that the leaves were characteristically glandular beneath in S. lagascaeformis, but 6 of the 7 specimens seen in this study lack glands.

GROUP E. The group contains the following one species.

Simsia calva (A.Gray & Engelm.) A.Gray, Pl. Lindh. 2: 228. 1850.

Barrattia calva A.Gray & Engelm., Amer. Jour. Sci. ser. 2.
3: 275. 1847.

The distinctive species is one of the northernmost of the genus and one of two native in the United States. Distinguishing features include the retrorse scabrosity of the stem, the foliaceous disks on the nodes of the stem, and the 15-30 ray flowers per head. The most commonly noted feature of the species is the lack of awns on the achene. This character is apparently more significant in this species since awns are reduced or lacking even on the pubescent achenes of var. subaristata (A.Gray) Blake.

GROUP F. The group contains the following two species.

Simsia annectens Blake, Contr. Gray Herb. n.s. 52: 43. 1917.

Blake stated that S. annectens was "A species connecting the S. setosa group with that of S. amplexicaulis". This may have been based on the intermediate form of the phyllaries and the broad wings on the petioles continuous with the nodal disk. The species has very many distinctive features indicating more remote relationship such as the widely diverging branches of the inflorescence.

Simsia hintonii H. Robinson & R.D. Brettell, sp. nov.

Herbae erectae 4 m altae pauce ramosae. Caules rubescentes aliquantum striati minute puberuli et grosse hispide setiferi. Folia inferiora permagna, petiolis usque 12 cm longis superne late alatis, laminis 30 cm longis 31 cm latis valde trilobatis. Folia superiora minora, petiolis 2-5 cm longis distincte alatis, alis e base sensim latioribus ad laminas continuis, basibus petiolorum in discis 1.0-1.5 cm latis conjunctis, laminis 3.5-11.5 cm longis 1.5-7.4 cm latis plus minusve trilobatis aliquantum ficiformis ad apices anguste acuminatis margine serratis vel crenato-dentatis base late truncatis vel cordatis abrupte in alis petiolorum cuneatis, supra basin valde trinervatis, supra distincte piliferis et minute aliquantum dense puberulis, subtus aliquantum dense puberulis in nervis et nervulis distincte piliferis. Inflorescentiae parce cymoso-paniculatae, pedicellis penultimis late divaricatis usque ad 4.5 cm longis, pedicellis

ultimis paucis 0.3-1.0 cm longis dense hispidis et minute puberulis sparse glanduliferis. Capitula 1.3-1.5 cm alta 1.0-1.2 cm lata. Involucri squamae ca. 16-18 inaequilongae 2-3-seriatae lanceolatae 7-13 mm longae 1.5-2.0 mm latae anguste acutae vix attenuatae extus et margine dense hispidae; radii ca. 5 flavi ca. 1.0 cm longi; paleae margine scariosae integrae vel grosse serratae apice acute non scariosae hirsutae extus ad medium hirsutae, paleae exteriores in partibus mediis induratis latiores extus puberulae superne hirsutae; corollae disci ca. 7.5 mm longae; thecae antherarum ca. 3.5 mm longae; achaenia ca. 5.5-6.0 mm longa appresso-setifera; pappus distincte bisetosus, setis perfragilis facile caducis. Grana pollinis ca. 27 μ diam. longe spinosa.

Type: MEXICO: Guerrero: Mina. Puerto Rico, 1800 m, by forest stream, 4 m high, flower pale yellow, 12-10-39, Hinton et al. 14976 (Holotype US).

The species has much of the habit and leaf shape of Simsia annectens including the widely divaricate pedicels of the inflorescence, but the wings of the petioles do not reach the basal disk in the lower leaves, the phyllaries are hirsute on the outer surface, the leaves are puberulous rather than densely minutely scabrellous on the upper and lower surfaces, and the stems have less glands.

GROUP G. The group contains the following six species. Since phyllaries are an important character in the group, care should be taken in distinguishing phyllaries with their linear-oblong strongly scabrous rather blunt tips from the more membranous scarios-margined sharply pointed outer paleae. Coloration of exposed parts of phyllaries and outer paleae is often the same.

1. Stems, leaves and phyllaries densely glandular pubescent 2
1. Stems, leaves and phyllaries sparsely or not glandular pubescent 3
 2. Petioles of lower leaves narrow at bases, not fused into nodal disk S. foetida
 2. Petioles of lower leaves very broadly winged at base, fused into disk surrounding node S. cronquistii
3. Undersurfaces of leaves densely and finely pilose S. panamensis
3. Undersurfaces of leaves with setae sparse or coarse 4
4. Heads with ca. 40 phyllaries and ca. 20 rays S. grandiflora

4. Heads with ca. 20-25 phyllaries and ca. 10-12 rays 5
5. Lower nodes of stem with scarcely to broadly clasping but not conjoined bases of petioles; setae on leaves distinctly antrorse, appearing combed; achene 3.0-5.0 mm long
S. amplexicaulis
5. Lower nodes of stem usually with distinct foliar disks on sides between bases of petioles; setae on leaves very long erect or irregular, most prominent on veins; achene 5.0-6.0 mm long.
S. guatemalensis

Simsia amplexicaulis (Cav.) Pers., Syn. 2: 478. 1807.

Coreopsis amplexicaulis Cav., Descrip. 226. 1802.

The species is distributed from northern Mexico southward into Guatemala. Included here is the concept initially treated as S. foetida by Blake (1913) but later corrected (1917). To the many synonyms we add S. triloba Blake which was originally distinguished by the larger achenes (5-6 mm long). Achenes of the isotype specimen that have been seen are all 5 mm long and within the size range noted for S. amplexicaulis in this study. Variations in S. amplexicaulis include specimens from Guatemala with longer setae on the leaves causing some confusion with the related S. guatemalensis n.sp., and one specimen with conjoined petiole bases (Coahuila: Sept. 1898, Palmer 422, US). The conjoined bases tend to be bilobed and broadly attached to the petioles and less like the foliaceous disks of related species. Specimens with glabrous and awnless achenes are referred to var. decipiens Blake, but at least one isotype of var. decipiens is not of the variety.

Simsia cronquistii H. Robinson & R.D. Brettell, sp. nov.

Herbae erectae ca. 1 m altae pauce ramosae. Caules flaviteretes distincte striati sparse longe piliferi glandulis longiuscule stipitatis dense obsiti. Folia inferiora opposita petiolata, superiora alternata sessilia, petiolis 4-5 cm longis superne anguste marginatis base late marginatis in discis 2-3 cm latis conjunctis, laminis foliorum inferiorum 9-10 cm longis 7-8 cm latis late ovatis vel deltoideis breviter acutis margine crenato-dentatis base truncatis trinervatis utrinque distincte glanduliferis et minute scabrellis supra sparse setiferis, laminis foliorum superiorum 3-11 cm longis 0.7-5.5 cm latis anguste oblongis vel panduriformibus base rotundatis vel auriculatis. Inflorescentiae laxae cymoso-paniculatae pauce capitatae, pedicellis 1-9 cm longis distincte breviter glanduliferis et longe hispidis. Capitula 1.3-1.5 cm alta, ca. 1.5 cm lata. Involucri squamae ca. 22-24 subaequilongae ca. 2-seriatae lineari-lanceolatae 10-13 mm longae usque ad 2 mm latae superne oblongo-lineares attenuatae ad apices obtusae margine et extus valde hispido-setiferae; radii (7)-8-(10) pallidi 8-9 mm longi; paleae flavo-virides margine scariosae integrae vel pauce

serrulatae, apicibus et partibus mediis induratis minute puberulis; corollae discis ca. 7 mm longae; thecae antherarum ca. 3.5 mm longae; achaenia ca. 5.0 mm longa appresso-setifera; pappus distincte bisetosus. Grana pollinis ca. 23-25 μ diam. longe spinosa.

Type: MEXICO: Oaxaca: 97 miles southeast of Oaxaca and 54 miles northwest of Tehuantepec. Elev. about 3100 ft. Roadside weed along the Pan-American highway in small-forest region dominated by Lysiloma, Bursera, Euphorbia, and other deciduous angiosperms. Heads rather light yellow, tending to nod at anthesis, later becoming erect. Rays 7-10, most commonly 8, neutral, epappose. Disk achenes strongly flattened but scarcely winged, with a pappus of 2 paleaceous awns. Chromosome number det. by B.L. Turner as $n=ca. 17$. October 13, 1962, Cronquist 9661 (Holotype US).

The new species is very close to Simsia foetida in habit, leaf pubescence, and in structure of phyllaries and paleae, but it is strikingly different in the foliaceous disks at the bases of the lower leaf pairs. The new species also occurs to the east of the known range of S. foetida.

Simsia foetida (Cav.) Blake, Proc. Amer. Acad. 49 (6): 385. 1913.

Coreopsis foetida Cav., Icon. 1: 55, t. 77. 1791.

The species occurs in Mexico from Nayarit eastward to central Oaxaca. The concept is that initially treated as S. adenophora (Greenm.) Blake by Blake (1913) but later corrected (1917).

Simsia grandiflora Benth. ex Oersted, Vidensk. Medd. Kjöbenh.

1852: 92. (1853).

The concept of the species is expanded here to include all members of the group having or being cited as having approximately 20 rays per head. Included here is S. polycephala Benth. ex Oersted., described at the same time as S. grandiflora with the comment "Affinis S. grandiflorae, sed caulis multo tenuior, corymboso-ramosus, foliis (Quae valde imperfecta vidi) basi raro dilatata, capitula paulo minora, involucris squamae obtusiora, ligularum lamina vix 2 lin. longa. An tamen S. grandiflorae var?" The differences cited by Bentham are almost entirely those characteristic of younger plants. Only the dilatate leaf bases are significant and material seen indicates the character is variable in S. grandiflora as it is in the related S. amplexicaulis.

Simsia megacephala Sch. Bip. ex Blake, Proc. Amer. Acad. 49 (6): 391. 1913, described from cultivated material, seems very close to or the same as S. grandiflora. The species was separated by Blake primarily on the basis of the achenes being 6.0-7.3 mm long and all the leaves rather than just the upper ones having broadly margined clasping bases.

Simsia guatemalensis H. Robinson & R. D. Brettell, sp. nov.

Herbae erectae 1.0-1.5 m altae pauce ramosae. Caules obscuro-flavi teretes leniter striati minute puberuli et longe hispidosetiferi. Folia inferiora opposita distincte petiolata, superiora alternata breviter petiolata vel sessilia, petiolis usque ad 5 cm longis plerumque emarginatis ad discos distinctos 0.5-1.0 cm latos non conjunctis, laminis inferioribus usque ad 9 cm longis 8 cm latis late ovatis cordatis breviter acutis margine serratis base trinervatis, laminis superioribus ovatis vel anguste ovatis 2.5-3.0 cm longis 1.0-2.3 cm latis base rotundatis vel cuneatis, laminis supra dense puberulis et sparse longe setiferis subtus puberulis et plerumque in nervis longe hispidis. Inflorescentiae laxae cymoso-paniculatae multicapitulatae, pedicellis 1-8 cm longis dense glandulo-puberulis et longe hispidosetiferis. Capitula ca. 1.3 cm alta ca. 1.5 cm lata. Involucris squamae ca. 25 subaequilongae 2-3-seriatae lanceolatae 7-10 mm longae breviter acutae margine et extus longe hispidae; radii 10-12 flavi 7-8 mm longi; paleae exteriores extus in partibus mediis plus minusve obscuro-virides margine scariosae superne serratae vel laciniatae, apicibus abrupte acutis non scariosis scabris; corollae disci 6-7 mm longae; thecae antherarum ca. 3.5 mm longae; achaenia 5.0-5.5 mm longa appresso-setifera; pappus distincte bisetosus. Grana pollinis ca. 23-25 μ diam. longe spinosa.

Type: GUATEMALA: Amatitlán: Amatitlán, alt. 1200 m, Oct. 1904, Tuerckheim 8701 (Holotype US). Additional specimens seen: GUATEMALA: Chiquimula: vicinity of Chiquimula town, dry thickets along Chiquimula river, herb 1-1.5 m, rays & disk yellow, common, Dec. 4, 1969, Molina & Molina 25110 (US); Santa Rosa: Chupadero, alt. 1600 m, Oct. 1892, Heyde & Lux 3810 (US); Cerro Redondo, alt. 4500 pp. Oct. 1894, Heyde & Lux 6160 (US). EL SALVADOR: Chalatenango: Highway to La Palma, dry thickets along Tejutla creek, herb 0.5-1.5 m, heads yellow, common, Feb. 22, 1968, Molina & Montalvo 21575 (US); Santo Domingo, "Chichinguaste" ? 1922, Calderón 1209 (US). NICARAGUA: Estelí: 4 kms on way to San Juan Limay, common in thickets along road, fls. & rays yellow, alt. 1000 m, Nov. 6, 1968, Molina 23157 (US).

The new species is close to Simsia amplexicaulis but is distinct by the small disks on the lower nodes of the stems which are not or scarcely attached to the bases of the petioles. The hairs on the leaves are also more erect or irregularly spreading and not "combed" as in S. amplexicaulis. All achenes of disk flowers seen are 6-7 mm long while those of S. amplexicaulis are 3.5-5.0 mm long.

Simsia panamensis H. Robinson & R. D. Brettell, sp. nov.

Herbae erectae 1-3 m altae varie ramosae. Caules parum rubescentes teretes leniter striati puberuli et sparse pilosi. Folia inferiora opposita distincte petiolata, superiora alternata breviter petiolata vel sessilia, petiolis usque ad 7.5 cm longis

plerumque emarginatis in foliis superioribus base raro breviter alatis amplexicaulibus non conjunctis, laminis ovatis vel deltoideis inferioribus usque ad 15 cm longis 14 cm latis plerumque 4-10 cm longis 2-5 cm latis acutis vel breviter acuminatis margine serratis vel serrulatis base truncatis vel leniter cordatis trinervatis supra breviter puberulis et ubique subtiliter pilosis subtus dense subtiliter pilosis. Inflorescentiae laxae cymoso-paniculatae pauce capitatae, pedicellis plerumque 2-9 cm longis dense puberulis et hispido-setiferis pauce glanduliferis. Capitula ca. 1.3 cm alta 1.3-1.5 cm lata. Involucri squamae ca. 30 subaequilongae 2-3-seriatae oblongo-lanceolatae 6-10 mm longae breviter acutae demum longiores margine et extus hispido-setiferae; radii ca. 15 flavi 6-11 mm longi; paleae flavo-virides margine scariosae superne serratae vel breviter laciniatae, apicibus abrupte acutis non scariosis puberulis vel scabrellis; corollae discis ca. 6 mm longae; thecae antherarum ca. 3.0 mm longae; achaenia 3.0-4.5 mm longa appresso-setifera; pappus distincte bisetosus. Grana pollinis ca. 23-25 μ diam. longe spinosa.

Type: PANAMA: Panama: Bella Vista, "Sirvulaca," brushy field; herb 4-8 ft., abundant, rays yellow, Nov. 28, 1923, Standley 25386 (Holotype US). Additional specimens seen: PANAMA: Coclé: Aguadulce, in savannas, near sea level, Dec. 3-6, 1911, Pittier 4847 (US); Penonome and vicinity, 50-1000 ft. elev., 1-2 ft. high, fls. yellow, Feb. 23-March 22, 1908, R.S. Williams 242 (US); Rio Hato airstrip, herb to 4 ft.; heads yellow, Dec. 23, 1966, Burch, Oliver and Robertson 1146 (US); Herrera: Road from La Avena to outskirts of Pese, alt. ca. 200 ft; herb, erect to 7 ft., heads yellow, Dec. 25, 1966, Burch, Oliver & Robertson 1312 (US); Los Santos: 17.8 miles S of Macaracas, alt. 1100 ft., roadside and secondary woods; stems to 1 m, heads yellow, May 25, 1967, Lewis, MacBryde, Oliver & Ridgway 1616 (US); Panama: vicinity of Panama, Feb. 24, 1923, Macbride 2604 (US); Punta Paitilla, herb 10 ft., Feb. 22, 1923, Piper 5427 (US); Punta Paitilla, roadside, herb 2.5 m, Nov. 17, 1921, Heriberto 222 (US); Sabanas, north of Panama City, Bro. Paul 595 (US); Tumba Muerto Road, near Panama, moist thicket, branching herb 3-6 ft., common, flowers bright yellow, Jan. 6, 1924, Standley 29788 (US); Canal Zone: Ancón Hill, open grassy slope; erect herb 4 ft., rays bright yellow, Nov. 26 - Dec. 9, 1923, Standley 26385 (US); Balboa, moist thicket, branching herb 4-8 ft., common, flowers yellow, Nov., 1923 - Jan., 1924, Standley 27148 (US); Thicket, bushy herb 4-8 ft., abundant, flowers yellow, Nov., 1923 - Jan., 1924, Standley 32098 (US); Along the old Las Cruces Trail, between Fort Clayton and Corozal; in thicket, herb 4-8 ft., common, flowers bright yellow, Dec. 31, 1923, Standley 29209 (US).

The new species is what has been called Simsia grandiflora in Panama but it differs by the softly piliferous leaves and by the smaller number of phyllaries and rays. Simsia dombeyana DC.

of South America is also closely related but has shortly puberulous leaves and fewer phyllaries and rays.

GROUP H. The group contains the following seven species.

- | | | |
|---|------------------------|---|
| 1. Heads sessile in clusters | <u>S. steyermarkii</u> | |
| 1. Heads with short to long pedicels | | 2 |
| 2. Leaves with rather dense erect pilosity beneath | | 3 |
| 2. Leaves only short puberulent or glanduliferous beneath | | 4 |
| 3. Leaves without two distinct sizes of setae on the upper surface, phyllaries without hirsute fringe | <u>S. holwayi</u> | |
| 3. Leaves with two distinct sizes of setae on the upper surface, margins of phyllaries with distinct hirsute fringe | <u>S. molinae</u> | |
| 4. Stems, leaves and pedicels with only non glandular hairs; phyllaries without distinct hirsute fringe on lower part | <u>S. grayi</u> | |
| 4. Pedicels and usually stems and leaves with distinct short glandular hairs; phyllaries with distinct hirsute fringe on margins and base | | 5 |
| 5. Heads 1.2-1.5 cm high; stems with numerous long setae (Sonora, Chihuahua) | <u>S. setosa</u> | |
| 5. Heads about 1.0 cm high; stems with setae rather sparse and short (Central Mexico) | | 6 |
| 6. Heads with 10-15 disk flowers; stems sparsely glandular-haired | <u>S. tenuis</u> | |
| 6. Heads with 20-30 disk flowers; stems densely glandular-haired | <u>S. subsetosa</u> | |

Simsia grayi Blake, Jour Wash. Acad. Sci. 18 (2): 26. 1928.

Two specimens are cited by Blake in his description of the species, but a note accompanying the photograph and type fragments in the U.S. National Herbarium indicates no. 561 is the type. An additional specimen has been seen in this study which differs only in having coarser scabrosity on the leaves, MEXICO: Michoacan: Distr. Zitacuaro, Zitacuaro-San Jose Purua; alt. 1650 m, edge of banana orchard in barranca; 2 m high; flower light greenish-yellow, Hinton et al. 13260 (US 2 sheets).

Simsia holwayi Blake, Contr. Gray Herb. n.s. 52: 46. 1917.

The species is known only from the type collection, GUATEMALA: Agua Caliente, on Barrios-Guatemala City Railway, 4 Feb. 1917, Holway 854 (GH, US).

Simsia molinae H. Robinson & R.D. Brettell, sp. nov.

Herbae erectae 1-2 m altae pauce ramosae. Caules rubescentes teretes vix striati sparse minute puberuli, setis longioribus distinctis sparsioribus. Folia opposita distincte petiolata, petiolis anguste marginatis 0.5-2.0 mm longis base in discis 1.0-1.5 cm latis conjunctis, laminis 3.0-6.5 cm longis 1.5-4.5 cm latis deltoideis vel distincte trilobatis base truncatis vel cordatis distincte trinervatis apice sensim anguste acutis vel acuminatis margine leniter crenulatis supra dense minute scabrelis et sparse longius setiferis subtus dense minute piliferis in nervis etiam sparse setiferis. Inflorescentiae laxae cymosae, pedicelli 0.1-3.0 mm longi sparse setiferi, minute puberuli et glanduliferi, glandulis distincte breviter stipitatis. Capitula 1.0-1.2 cm alta 0.8-1.0 cm lata. Involucri squamae ca. 18-22 valde inaequilongae 3-4-seriatae lanceolatae vel oblongo-lanceolatae 5-11 mm longae 1-2 mm latae anguste breviter acuminatae extus minute puberulae et glanduliferae base et margine dense longe hirsutae; radii 6-9 flavi ca. 1.2 cm longi; paleae margine scariosae dentatae vel lacinatae apice acute vel acuminatae non scariosae hirsutae, paleae exteriores in partibus mediis induratis latiores extus puberulae; corollae disci ca. 6-7 mm longae; thecae antherarum ca. 3.5 mm longae; achaenia ca. 5.9 mm longa appresso-setifera; pappus distincte bisetosus. Grana pollinis ca. 25-27 μ diam. longe spinosa.

Type: NICARAGUA: Estelí: Vicinity of Guava 20 kms from Estelí, common along Estelí river, Fls. & rays yellow, herb 1-2 m tall, Nov. 5, 1968, Molina 23122 (Holotype US). Additional specimen seen: HONDURAS: Morazán: Río de La Orilla, southeast of El Zamorano, base of Cerro Majicarán, 750-800 m; moist thicket, herb 1-2 m, rare, heads bright yellow, Nov. 1948, Standley 14009 (US).

The new species is like Simsia holwayi Blake in the fine dense pubescence on the lower leaf surface but is different by the more broadly deltoid less deeply lobed leaves with more crenulate margins, by the two distinct sizes of setae on the upper leaf surface and by the distinct hirsute fringe on the phyllaries.

Simsia setosa Blake, Proc. Amer. Acad. 49 (6): 379. 1913.

The species is known only from Sonora and Chihuahua in northern Mexico.

Simsia steyermarkii H. Robinson & R.D. Brettell, sp. nov.

Herbae erectae minimum 1 m altae non vel pauce ramosae. Caules rubescentes teretes sparse minute puberuli, setis long-

ioribus distinctis sparsioribus. Folia opposita breviter petiolata, petiolis anguste marginatis 5-8 mm longis base in discis ca. 1.0 latis conjunctis, laminis 1.5-3.2 cm longis 0.8-2.0 cm latis deltoideis anguste acutis argute serratis base truncatis vel leniter cordatis trinervatis supra dense minute scabrellis et sparse longius setiferis subtus dense breviter horridis. Inflorescentiae subpaniculatae pauce capitatae in glomerulis breviter pedicellatae; pedicelli plerumque 1 mm longi. Capitula 1.0-1.2 cm alta 0.8-1.0 cm lata. Involucri squamae ca. 16-20 valde inaequilongae 3-4-seriatae lanceolatae vel oblongo-lanceolatae 3-8 mm longae 0.5-2.0 mm latae anguste breviter acuminatae extus minute puberulae margine et ad medium longe hirsutae; radii ca. 9 flavi ca. 8-10 mm longi; paleae margine scariosae serratae vel laciniatae apice acute non scariosae dense hirsutae extus ad medium hirsutae, paleae exteriores in partibus mediis induratis latiores; corollae disci 6.5 mm longae; thecae antherarum 3.5 mm longae; achaenia ca. 4.0 mm longa appresso-setifera; pappus distincte bisetosus. Grana pollinis ca. 25-27 μ diam. longe spinosa.

Type: GUATEMALA: Zacapa: Trail between Santa Rosalía de Mármol and Vegas, Sierra de Las Minas; flowers yellow, Jan. 19, 1942, Steyermark 42931 (Holotype US).

The new species may be closest to *Simsia molinae* n. sp. but the present species has heads in distinctive compact glomeruli, has phyllaries hirsute on the outer surface, has leaves more serrate and less lobed, and has much more coarse pubescence on the undersurface of the leaves.

Simsia subsetosa H. Robinson & R.D. Brettell, sp. nov.

Herbae erectae 3-4 m? altae pauce ramosae. Caules rubescetes teretes leniter striati minute glandulo-puberuli sparse breviter setiferi. Folia plerumque opposita petiolata, superiora alternata breviter petiolata vel sessilia, petiolis usque ad 2 cm longis superne sensim anguste alatis base in discis ca. 1.0 cm latis conjunctis, laminis plerumque 4-6 cm longis 2.0-4.5 cm latis deltoideis vel trilobatis acutis margine serrulatis base rotundatis vel truncatis abrupte anguste cuneatis supra basin trinervatis utrinque perminute puberulis et glanduliferis sparse breviter setiferis; folia superiora 1-4 cm longa ovata vel rhomboidea. Inflorescentiae laxae cymoso-paniculatae, pedicellis 0.5-3.0 cm longis dense glandulo-puberulis sparse breviter setiferis. Capitula ca. 1.0 cm alta 0.8-0.9 cm lata. Involucri squamae ca. 18-20 inaequilongae 2-3-seriatae lanceolatae 5-8 mm longae anguste breviter acuminatae margine et base profuse longe hirsutae; radii 8-10 pallidi ca. 5 mm longi; paleae exteriores extus in partibus mediis obscuro-virides pauce setiferae margine scariosae superne serrulatae dense setiferae; corollae discis ca. 20-30 ca. 5.5 mm longae; thecae antherarum ca. 3.0 mm longae; achaenia 4.0 mm longa appresso-setifera; pappus distincte bisetosus fragiles. Grana pollinis 23-25 μ diam. longe spinosa.

Type: MEXICO: Mexico: Temascaltepec: Rincon del Carmen, 1340 m, woods; 3 m high, Nov. 23, 1932, Hinton 2693 (Holotype US). Additional specimen seen: Temascaltepec: Ixtapan, 1000 m, hill; 4 m high, Dec. 13, 1932, Hinton 2935 (US).

The pubescence of the lower leaf surface in the new species is very short and relationship is closest to Simsia setosa Blake S. tenuis (Fernald) Blake and S. grayi Blake. Of the related species S. setosa has larger heads, more setose stems and unwinged petioles, S. grayi has phyllaries only puberulous or shortly setiferous and stems and leaves non glandiferous, S. tenuis has unwinged petioles, sparsely glandular stems, less densely puberulent leaves and heads with only 10-15 disk flowers.

Simsia tenuis (Fernald) Blake, Proc. Amer. Acad. 49 (6): 380. 1913.

Encelia tenuis Fernald, Proc. Amer. Acad. 33: 94. 1897.

The species is known only from the type collection, MEXICO: Guerrero: Edge of cornfield, Nov. 1894, Palmer 96 (GH, US).

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